CHAPTER XVII

Pentagon IV

A: When the time came to leave Korea about the 2d or 3d of February 1958, I went to Japan for a couple of days and made a presentation to the Japanese-American Chamber of Commerce.I also met with some Japanese scientists who had learned I was going back as the Army Chief of Research and Development.

On January 31st, of course, our first Explorer missile had been launched successfully into orbit and excitement was high. This was a great landmark after the Russians with their Sputnik 1 had beaten us by three or four months. This need never have occurred. The Army had the capability to do this job, and had had it for some time, but they were not permitted to do it; perhaps because nobody thought they could do it or there is always the other case where somebody doesn't want to see something done. I lived with that later.

I rushed back, spending only a couple nice days in Hawaii, where I could have thawed out for a week or two, and would have taken some leave if I could have, but Washington said, "No, you must get right back." I got right back and I reported in and then took some leave. I went down to Sea Island with my wife where we froze for a week or ten days instead of being in Hawaii where I could have been in the warmth and sunshine. There wasn't that kind of a rush. Gavin wasn't going out until the 31st of March, and there was no use for the two of us sitting there facing each other. This business of long overlap of senior people in responsible positions is for the birds. I took some leave and then I came aboard as a deputy. I used a good share of the month of March just getting around to various establishments, various companies.

I visited the three motor companies. I remember Detroit particularly; I spent over a week there. This always reminds me of a little story. They gave detailed briefings and some nice entertaining. It was very worthwhile getting briefed on their R&D concepts and their approach to business with the Army. One company gave me a luncheon and the Chairman of the Board was there and his top people. One of his people said to me, "General, we know you are just back from Korea and if you wouldn't misunderstand our motive, we'd love to have our distributor turn over a so-and-

building Nike Ajax, he finally overrode this opposition with a statement that should still be borne in mind today: "There is a time when research must cease and something put into production and then you learn by doing and proving that you are right to that point." This is a fair statement and it has worked well where it has been applied. After Nike Ajax had succeeded, the Army was allowed to go for Nike Hercules.

This was the next step, to knock down aircraft even with supersonic speeds up to heights of say 100,000 feet, although actually it probably can do more as it has been developed. Having seen this and knowing the threat now that was coming from missiles and satellites in orbit, it became quite apparent that something should be looked at here. While a number of systems were suggested then, and have been suggested since by the other services in particular, Nike Zeus was approved for research and development on April 1st, 1958, the day that I assumed the responsibility of Chief of Army R&D.

I've ridden herd on that one since we both started off together. I take no credit for having gotten it adopted as it was adopted during March while I was still in an acting or deputy stage. But I've followed it like a hawk since then, and I don't mean the kind of hawk that is trying to make war. I was following to see that it became a reality. To my knowledge even today, they keep changing the name. They changed it from Zeus to what they call it today. They call it Safeguard now, Nike X, and they've had a lot of names, but it is still the Nike system, advanced by having reached certain phase lines before and then someone having the guts to put them into production and go on to the next stage. We've got this capability of knocking down satellites if we will build it. If we don't build it that is something else; that is where we are today -- naked as a jaybird. In any event, I was convinced of the capability of a missile knocking down another missile, particularly when the satellite is not maneuverable, when it is following a constant path. To me that is like a vehicle coming down a straight road; if you can intercept it something happens and there is nothing they can do about it. Now when we get to maneuverable satellites (we may be there; we are, I think) the question is somewhat changed, yet the relative speeds are such that you can still bring the missile by radar to hit a manueverable target in space.

In that connection I tried to set up a program for firing one missile against another at White Sands and this was frowned on, again by certain people who didn't think it could be done and by others who didn't want us to prove that it could be done. But we did fire such a missile. What we did was fire a Nike Hercules against one of the old WAC Corporals. I've forgotten the date, it was 1959 or 1960. I've got a fragment from it in a piece of plastic downstairs. What happened was, Hercules knocked the WAC Corporal out of the sky, and we repeated that on several occasions. Some people said, "Of course, you knew it was coming." Yes, we knew it was coming and we knew from about where it was coming although the angle at which they fired with respect to the intercepting weapon, the Nike, was changed several times from the firing point. But the point I'm making is this: since this was a short-range missile (the WAC Corporal), its time of flight was limited and that part of its time of flight, where it was observable from line of sight in order to pick it up and track it by radar, was only 17 seconds, whereas the minimum estimated time for acquiring an incoming satellite is up to 30 seconds. We were really accomplishing something with less time than would normally be available, assuming everybody's equally on alert at the time of launch. At that time, as interested as we were in space, it was quite evident that we weren't the only people there. The Air Force had its interest, as I said, in Thor and, of course, NASA was being brought to life.

I wrote a paper which was staffed and which I presented to Congress in this connection because I felt that the Army did have a real place in space, at least to the degree of having missiles of short or longer ranges. I also recognized that, above all, there was a military requirement in space which was anathema to the scientist and also to the Eisenhower administration. There seemed to be a feeling that if we didn't admit that there was a military potential for missiles and satellites in space the Russians wouldn't find it out, which is so naive that it isn't even worth considering. Nevertheless it did have a tremendous influence on American politics. My recommendation was as follows, and I was permitted to give it to the Congress: First, let the Army continue since it has the capability and we had a good portion of the men who had been brought over as scientists from Germany under the old "paper clip" program; they had really done the scientific development on much of what we had accomplished. Secondly, if they wouldn't

give it to the Army, have a Defense Space Agency that would take over all Defense space effort. Thirdly, if they wouldn't do that, then give it to the Air Force. When I said this before the Congressional Committee on Science and Astronautics, they couldn't believe it; they couldn't believe it. The senior Republican member on the committee, then as now, was Congressman Jim Fulton from Pittsburgh. That was before I had gone to Pittsburgh for Gulf Oil, so I was just getting acquainted with him. He is a very erudite and astute man and when I said, "Give it to the Air Force," he said, "Do you mean to tell me the Army would give something to the Air Force?" And I said, "Yes, in the interest of national defense. If you won't put it at Defense Department level, then give it to the Air Force. Furthermore, I don't want to see the Air Force being only the 'silent silo sitters of the 70s'," and that is where that famous term arose. I got some dark glances from certain people in the Pentagon on that one. Most of my Air Force friends thought it was a pretty good statement. I also got some wonderful cartoons showing airmen who were lifting the cover up on their silo, sticking their heads out and saying, "How about my flight pay?" and things of that sort.

In any event, you know what happened. It was given to NASA so the Army had to turn over most of what we had built down at Huntsville. Now 10 years later, almost 12 years later, there is at least some degree of public admission that there may be a military aspect to space, so we'll see what happens.

The importance of technical intelligence came upon me full blast at that time, and of course, as I told you, it had only been really three years, three to four years earlier when I was G-2, that I had strengthened technical intelligence and the Army's collection ability through their attache system. I continued to work closely with G-2 with a view of getting some men who understood what it was all about in attache jobs when they left R&D. Even from an overt position of an attache they could get a sensing, either directly or through third country information, of what was going on in whatever area they were stationed in the world. Another thing I did was to try to interest industry in building better conventional weapons. The success in space was getting the Army to think so much about space -- and this was a limiting factor in my mind -- that there was a tendency to disregard conventional weapons. I was opposed to that

thinking. I mentioned that in Sweden one of our magazines had come out years earlier and said that we'll win this with the big bomb -- you know, all-out nuclear power -- but they were concerned about their ground forces being degraded. It was beginning to dawn on people that maybe this wasn't going to be all-out nuclear war or nothing, that maybe there was going to be real deterrence and, therefore, the relative strength of conventional forces in the face of the Russian aggressive attitudes could be very, very important. Years before that, when I was at the War College and out at one of the early shots in the Pacific, Gavin was there also. At that time he was, I think, the head of WESEG; I was Deputy Commandant of the War College. We talked a great deal with members of the Atomic Energy Commission about the fact that this was not going to be all-out nuclear war; in other words, that no ground power was going to be needed. We were trying to interest them, you see, in development of tactical nuclear weapons through the AEC, for tactical support of ground forces; of course, after years this came about. It was very interesting because the minute that we'd get with one of the influential people in the AEC, people who were inclined in this direction, we immediately found that the chap who had joined us for a drink was a certain general in the Air Force. His job out there was to see that the Army didn't convince the AEC that there was a ground role for nuclear weapons. I have to say this frankly because it did exist. We knew the man well.

In any event, now it became my job to push for the development of ground weapons to improve our ability to use them in conventional artillery or through missile systems that could be developed for tactical employment. I mentioned that after I left Korea we did have the capability of the Honest John and 280mm cannon, but neither of them was considered the long-range solution to the problem.

We were then faced with coming up with Pershing. Pershing created some interesting problems in that the Army hadn't fully come to believe in the systems approach and project managers were not here then. The Ordnance Corps prided itself on executing a contract but frequently had two or more major sub-contractors over whom nobody really exercised day-to-day coordinating authority. This came to light more with the Sergeant missile. The Sergeant missile was developed by the Jet Propulsion Laboratory, who had a

bunch of scientists who helped develop Redstone and Jupiter and how to get into space, a great bunch of men under Dr. Bill Pickering. Dr. Pickering tied in with Cal Tech. They had the design of the Sergeant system, but the Sperry people, or Sperry-Rand I guess it was, had taken over a factory in Salt Lake City and were going to build it. But the difference in concept between the scientist developing something and having it engineered to a point where it lent itself, with the greatest economy and efficiency, to mass production were two different tasks. The reason this lack of coordination appeared was because nobody was exercising enough coordination at the top. They were managing JPL from Ordnance at Huntsville, and they were managing a follow-on production contract with Sperry from the Office of the Chief of Ordnance. The interface was weak because there was nobody there day by day to get these two together and rap their heads, you know. We learned a lot about going more strongly towards "systems engineering" then, and soon that brought in the concepts of value analysis and value engineering which we applied. We learned a lot about that through General Electric, who had pushed for these concepts, and it was also applied vigorously by Martin-Marietta, who were building the Pershing, with the result that we simplified the construction and even changed the materials in it, probably with a savings of $3 or $4 million in the production of that particular missile.

Now to get back to industry. To industry this was going to be a war that was going to be fought by SAC and eventually missiles; in other words, the Army didn't amount to a hell of a lot. We bought some trucks; we bought a little of this and a little of that, but our budget was down. I felt that the education of industry, as far as I could do it, about the Army's problems was important. I took the Fortune list of 500 industries and picked out about 25 of those industries -- not necessarily the first 25, but 25 well up on the list of big industries -- and arranged through my Technical Liasion Office, which was for the purpose of making industrial contacts among other things, to go and make presentations to industry. I would take a team out and usually schedule four presentations other than my own. My remarks discussed three aspects of the Army's problem: fire power, mobility, and communications. Simple enough. If you've got those three licked and train an Army, you have got something moving. The fourth, of course, was basic research.

Basic research, when I arrived in the Army, was to some degree -- well, I shouldn't say that. It was non-existent at Army levels but it did exist in all of the Technical Services to some degree. Well, that "some degree" also included some degree of unnecessary duplication. It is so hard to define a new scientific problem that you can have the same problem under two different titles and different nomenclatures. Two men can be doing the same work, but doing it for two different parties, both of whom think they are getting a separate answer to two problems. To solve that, what I did was to take over the Ordnance Research Office set up at Duke University, take it away from Ordnance and establish it at Army level, then take money away from all services and make that the Army Research Office, in Durham, North Carolina. Well, the services howled bloody murder. I only took a couple million away from them the first year, but then we began taking more away. But they really couldn't gripe too much. Projects came in and, if it was work that was going on somewhere, it got a good screening by the Army Research Council -- I mean civilians as well as Army -- and then it was allocated back to the appropriate service, probably the one that had initiated it, with authorization of certain funds to go ahead with research. That is the way we moved a lot of our basic research and this, of course, was one of the presentations that we made to industry, trying to make it relevant to whatever that industry was; in other words it was different for General Dynamics than for General Motors, as an example. I took this team of five or six of us, and during the four years that I was Chief of R&D we went to some 20 or 25 industries. I had a very aggressive liasion officer. He always contacted the appropriate man at the corporate level and assured him that I would like to come out personally and bring an Army team and tell them what they could do for the Army, but would he come? In other words, would their top people be there, intimating that if they weren't we would send our second team, too. I think on every occasion that I went out the Chairman of the Board was there, the Chief Executive Officer who was usually the President, and an impressive cross-section of their senior corporate officers or directors. I might say even when I went to Sperry-Rand, no less a person than General MacArthur honored me by his presence at dinner, and he didn't turn out for many.

Our plan was about as follows: we would arrive and they would have us for dinner at night, and of course

this would be a little ice-breaking ceremony. In the morning we put on our four hours of presentation, my opening statement -- what basic research was doing and, as I said, fire power, communication, mobility. We would end up and go to lunch. After lunch they would come back and give us their presentation for four hours. Then, if the distance permitted, we went back that night. Or if it didn't, we scattered or did whatever we wanted or perhaps had dinner with some of them again and talked more about the day's work. This created tremendous interest. For instance, the Chairman of the Board of Alcoa, whom I got to know later, had all his people there, and when I got all through he said, "You know, I never thought of it because we don't produce the end product." I had just mentioned to him, "We're going to have your aluminum or your competitor's. One of them is going to have aluminum in 20,000 personnel carriers that weigh 10 or 15 tons each." Well hell, that is business and he began to perk up. From then, he changed their pattern of advertising and for a year or so they showed where their product was being used in support of the military effort, which was great. The chairman of another board, in this case General Motors, set up their meeting at the Allison plant near Indianapolis, I think. GMC had the operating and research heads from, I think, some 26 divisions present and this had happened practically never before. When he got through he said, "You know, this is the first time that I and some of my executives had ever heard a presentation across the board of what we can do ourselves in research."

The program sold itself pretty much and it did a great deal to strengthen the Army's position in industry; maybe it is one of the reasons that our friend Fulbright and some of these other birds are talking about the military-industrial complex. But we had better continue working together if we want to keep this country going.

The fight for aircraft was an interesting one. We had a couple of boards, one of which was the Howze Board. I believe very much in aircraft; I was very much for Army aircraft. What they have been doing in Vietnam is not a surprise to me. I think I mentioned before that I would like to see a study made on what they would have done without the helicopter and without armed helicopters. That would be quite a story. Even if we are losing a few a day, I mean, that is not the whole story. In any event, this was

difficult because the battle was still on with the Air Force as to missions, functions, and responsibilities. We were making pretty good progress when we brought in the Bell "Huey" aircraft which, of course, was the first turbine-powered aircraft. We went for the Chinook, which Vertol was making until Boeing brought it in. We went for the Caribou, the De Havilland plane, which was a fine plane, and then the Buffalo, its follow-on, which is even better. There was a lot of opposition to that, of course, because it was Canadian; yet here we are trying to keep in tight with the Canadians, to standardize on equipment, and we had to work with them. Another plane, of course, was the Grumman Mohawk. This was of great interest to us. It was built by Grumman in a plant under Navy cognizance and it's done its job beautifully. It was made for reconnaissance. It was made to carry side-looking radar for scanning behind the enemy's lines to try to get intelligence or, at least, information; all in all it is a fine craft. A couple funny things happened in connection with this one. This was opposed by the Air Force. I had been given certain instructions by General Lemnitzer one time: "Don't you arm this plane because I agreed with the Air Force that we wouldn't arm our planes." Well, it so happened that the plane factory was under Navy cognizance and so the Navy had thought perhaps that they or their Marines might have a use for the plane as well as the Army. So, lo and behold, when the plane was produced it had what they call "hard points" which is where you can hang bombs and other things under the wings; and, of course, I couldn't object to that. So that is the way the Grumman Mohawk came off.

We went ahead full speed. We had to beg, borrow, and steal our ammunition and our rockets. We found a hell of a lot of old machine guns the Navy was discarding, so we did all sorts of jerry-rig and bailing-wire stuff to put weapons onto helicopters for test purposes. I don't need to tell you how they've proven out in Vietnam. But that was a great struggle, particularly when McNamara came in because he wanted to cut us way back on everything, including parts. It got so bad that we were thrown into a situation where we could hardly keep 50 percent of our aircraft going because of the shortage of parts. I'm sure that since things really got moving in Vietnam that they must have been licked, but there were a number of efforts from all directions to cut us down.

Chemical weapons. I know that is one that you will want to bring up, or somebody will, in view of the fact that we are not supposed to have them anymore. I still would like to stand on the statement that if the North Koreans move against South Korea more delay could be obtained by saturating the DMZ with either lethal or non-lethal gases that make it practically impossible to cross, at least without great delay, than with any other conventional weapons system that exists. To me that would certainly be a justifiable use of it if they violated that armistice zone. Now it looks as though that may be thrown out for political reasons. What happened is this, and I don't see any reason why it can't be told now.

I was impressed about chemicals while I was a Corps Commander in Korea. I was impressed with the potential of chemical weapons and so I had special studies made. The board that I appointed came up with a recommendation to me showing what could be done in this respect. It was a good study; I approved it as Corps Commander and sent it on the Eighth Army. I followed it until I left there a few months later, and it was still lying around somebody's desk either there or possibly in Hawaii. In any event, I couldn't get my hands on it but I did find out that it wasn't in Washington. I was in a good position a few months later when I got back as Chief of Research and Development to call for the report, and it was found at Army Headquarters in Fort Shafter, Hawaii. We then called it forward and the report came and, as I remember, it had a favorable endorsement. There is a difference between favorable and enthusiastic, but I think it had a favorable endorsement. Well, when I got it back here, I started taking it up through DCSOPS and found that national policy as established by our national security policy council had a paragraph in there that, I don't know if you would say authorized or recognized -- but let's say recognized, chemical weapons might be used in ground conflict, but they had a clause in there, "In general war". So we had to take the necessary steps, at least did take the necessary steps, to get the policy modified to strike out the clause, "in general war." Otherwise we would have been very limited in trying to do anything in the way of developing the idea that we would use them on the offensive because we had that capability in World War II, but we never used them.

We never used them in World War II, we never used them in Korea other than tear gas and non-lethal irritants,

and I think anybody is really stretching the point when they call those chemical weapons. It seems that way to me anyhow. Well, in any event, I felt that we had to know what the enemy's capabilities were, and they were very great. We even had on hand the training regulations of the Russian Army and what they were doing to train their troops, including the use of injections against chemicals. They were highly trained to use weapons and to defend against them. We thought, how in the world can we learn how to defend against these weapons of various types, chemical and biological, unless we know something about them, which justified our research.

I might say in that connection that during those years, around 1960 and 1961, we put very substantial money, a considerable increase of funds, behind chemical weapons and biological, too. One of the things that we did, much to the disgust of some of the people in the Chemical Corps, was to put out a directive from OCRD that not more than ten percent of the increased funds in any year could be used in-house and that the other 90 percent had to go out by contract. I had two things in mind here; one was to interest more of the people in the chemical industry in getting into this aspect of assisting in their country's defense, and secondly, that if and when there were cutbacks or modifications, it would be a lot easier to terminate a contract or make a new contract than it is to get people off the government rolls. Whether my successor was able to hold them down or not I don't know, but during the two years after this policy went in, I did, to the best of my knowledge. That's that on chemical weapons. I think they have made a real contribution in what use they have had to date. While you may object that food has to be destroyed (and has been in some cases), nevertheless, in this kind of war -- and all war is getting to be more total war -- food is ammunition when it is in the hands of the enemy and all steps necessary have to be taken in the kind of conflict we face today.

Q: I have a few articles that I picked up. There are many, but one struck me, "A Painless Way to Win the War", which was on the psycho-chemical gas. You might refer to these.

A: We had many interesting things that occurred. Some of you will remember that when we started out, one of the things that we were showing was the cat and the mouse

film. This was a movie sequence where the cat, after being administered some of these non-lethal drugs, jumps all over the cage to get away from the mouse, scared to death. We ran tests with men also. You may remember, or you may never have seen, a picture on the use of any of these compounds against some troops in training at Fort Bragg. They literally fell apart at drill. Then another one: we sent one of our brigadier generals in the Chemical Corps to observe some tests which they gave to the people who were at the fire control center for an artillery battalion. The accuracy of their work after they had what appeared to be an innocuous cup of coffee was about 4 percent. So it showed that you just couldn't think logically with it. The interesting thing was that when this general went back to the Commanding General's office to report to him, they gave him a little coffee and by the time he had enjoyed his coffee and they had been talking a bit he forgot what he even came in to report on. These items are highly effective, and before we cut our own throats we had better take a look at some of them and permit them to remain in the inventory.

Q: I don't have it in front of me now, but am I wrong in saying that the psycho-chemicals that you were experimenting with then had as a base the LSD of today?

A: That was one of the compounds that was being looked at. LSD 25, yes, which we've known now for a long time, was one of them, no question about it. I hope that was not one of the factors that influenced this young and rabid rabble that we have been growing up here.

Q: Before we leave the chemical, I know it is a political decision today that has made us fall off. What about biological weapons? What did you do? You were involved in developing biological, at least getting some interest in biological weapons?

A: Right. As I say, food is a weapon. If you can deny the enemy their food you can bring him to yield, or at least you can go a long ways toward it. I don't know that any one weapon is total in its impact, and yet it could be. There are a lot of angles on this, and it is one of the threats that we may face because our country is open from the Pacific with a wind drift from west to east and from the earth itself moving from east to west; our cattle and our food areas could

be just overwhelmed with some of this stuff which could be leaked off aircraft or submarines surfacing at night or in many other ways.

Ground mobility, of course, was a major problem. This was true even with such things as conventional trucks, and there was great delay and many arguments in developing conventional trucks. It was true certainly with all the special vehicles such as this GOER vehicle, which we had put together and submitted straight off the shelf; in other words, all commercial parts, you know. They came up with a fine vehicle and it did all the things we expected it to around 1959 or 1960. Hell, I think they are still testing it even though excellent vehicles have been turned out, but everybody has gotten their damn finger in the pie. They want to add this and that and the kitchen stove, you see. They've raised it from 80¢ per pound, which was industry's first estimate for turning them out. I don't know what it costs today, but if it isn't $2 a pound I would be surprised. They are using some in Vietnam, but I don't know if they have ever type-classified them. Of course, let me say the big motor industry, conventional truck manufacturers, were not for this baby because it could go places where we can't use any truck in the inventory today. Of course, the same problem applied to certain other vehicles. The armored personnel carriers, for instance, are fine personnel carriers and yet there were two or three components where I had to override the Ordnance in favor of the contractor, not only for the good of the vehicle but for greater economy in the manufacture of the part or parts concerned. So we live with the NIH factor; we still do and I don't know how you get rid of that.

In Canada we worked very closely with the Canadians, with Canadian industry. We turned out the Chinook, we turned out certain engines for Canadair which is tied in with Pratt and Whitney, and many other items. We finally came up with what we called the HARP program, which means High Altitude Research Project. One of their scientists showed how an electronic device encapsulated could be fired at very high velocity into concrete walls, several thousand G's as a matter of fact, and still come out and be operative. He said if this is true why can't we fire a conventional gun into space. The fact is you can fire a conventional gun into space, and we now have a few of them. One Naval 16-inch gun welded in prolongation to another Naval 16-inch gun is quite something to see. It fires

vertically into space and we are not only capable of reaching well into space but we are capable, with the appropriate electronic devices on the projectile, to orbit it into space. There are many gains that have come from this. It had its heyday but now it is not being supported as much as it was. A lot of the resistance again has been the NIH factor in certain places both in the Army and the Navy.

Q: The NIH factor being?

A: Not Invented Here. We used to have another one, NIBO, Not Invented By Ordnance; I told you about the expansion of basic research. In rockets and missiles it is pretty well known that in 1959 we came up with the idea of stressing value engineering -- value analysis -- and, of course, now it has become pretty standard. There are some people who don't understand it because they say, well you've got engineers on the project and it is their job to see that everything is most efficient. But their job really is to build the vehicle and to build it according to schedule and according to blueprints. The job of the value engineer is to get around and say how can I do that better, what is wrong with that, is there a cheaper material or a better way to machine it, can we get rid of this lug there, or do we need this many screws or that many rivets. There is real money in the bank in this effort. All of big industry has gone for this now.

In electronics and communications, there were many advances. We've seen what we can do with infrared; we've seen what we can do with passive devices as far as improving visability at night. These are tremendous advances, I think. Then, of course, overmuch of this is operations research. These are the think tanks; I'm not surprised some of them are being cut back because I think many of them ran full speed ahead without really knowing where the hell they were going. Where the projects have been well defined and well directed -- and I don't mean keeping the blinders on too closely because you need latitude to roam a bit -- I think we've gotten a lot out of it, but it is time to ride herd on some of these operations research activities.

Materials. We've seen the greatest advance during this period. This gets into the heavy metals, the light metals, ceramics, cements, and plastics in particular. As a matter of fact, we have the

knowledge now where we can fabricate about any type of material we want, as long as we know what kind of performance we want to get out of it. I was a great believer in titanium. I fought for titanium for a long time. We have finally gotten it used, particularly in air foils and wings of airplanes at the present time. It has many other uses. Another material I'm still trying to get used is what we call depleted or spent uranium. This is uranium that no longer has any radioactivity. It is dull, inert, and a very dense and heavy product. I've been trying for more than ten years to get this used in armor-piercing shells because it should really be for free; there is so damn much of it and nobody knows what to do with it, you know. Of course, those who own it keep the price up high. Some day somebody will find a solution. I think I know the solution for a great deal of it, and that is for use in casks for moving spent nuclear elements from utility plants, which is going to be big business in the next ten years. This also could be substituted at a cheap price for tungsten, which is very expensive, in armor-piercing shells. In addition to having tremendous penetrating capability, even though it is sort of fragile, it has a tremendous pyrophoric effect. I guess that is the right word -- pyrophoric, fire, setting afire, yes. If it hits a turret it will not only spin around and knock shards off the inside but it will set the tank on fire. It has tremendous potential but we are still afraid of it. In small arms you know the efforts we made to go to flechettes, to go to little rocket-projected flechettes and the 40mm grenade and other improvements that are still available. I think we made a lot of headway. We were opposed in going toward the M-15 type rifle by some people in pretty senior positions who were still thinking of Camp Perry and the national rifle matches, hitting a 20-inch bullseye at 1,000 yards. That has gone by the board now. Actually when I got to Vietnam and was looking this over with the idea of establishing what I call the quick reaction laboratory, later to become the Limited War Laboratory about the time that I retired, I wanted to put something down there where the action was, even as early as 1961. This was frowned on. When I got into the question of weapons I found that one battalion -- and this reflected the leaders or the sergeants -- insisted the M-1 was the best rifle. There was another battalion that insisted that nothing but carbines were needed because it was enough for most of the short-range work, although they admitted it would not go through a 12-inch palmetto. But it

was short and easy to handle in the jungle. There was still another battalion under our friends in the CIA, and they insisted on shotguns. So you could find any answer you wanted. I sent 1,000 rifles of the M-10 or 14 -- I've forgotten which, but that same type of weapon that we are talking about today. I sent 1,000 of them down there and I also sent the ammunition for them by air. When I got there and had lunch with General McGarr, I asked about these rifles. He said fine, we got the rifles all right but we haven't got any ammunition. I thought, gee, that is funny, so I thought I would start working backwards. I took the time to go and talk to the G-4 and from the G-4, who didn't know anything about it (understandably), I went to his Ordnance officer and from his Ordnance officer I went to his ammunition officer and we finally went down to the sergeant who had charge of all the igloos. He didn't know anything about it except that he did say that he had some funny ammunition that came in there but he didn't have any weapons for it. Well, we finally got the two of them together. There is always somebody that doesn't get the word.

Q: You know, I didn't mention it when we were speaking of I Corps, but your interest in weapons for the Oriental was always high and I know you were attempting to design shorter stocks.

A: I was worried about the Oriental. I was worried about the Korean, whether or not the M-1 was the right rifle for his little short arms, particularly some of the younger ones and the men who were really using the rifles. I got in touch with General Sam Williams, a real soldier; I said, "What the hell about your problems because those Vietnamese are even smaller than the Koreans."

We did a lot to step up human engineering in our vehicles, too . . . the reaction of men under all conditions. You might say this had a touch of the social sciences, if you want to, and it did. Social sciences, life sciences -- we were across the board. I finally got the personnel section of the old Adjutant General's Office transferred to get into more personnel research. There was no reason that it shouldn't be integrated, in my opinion. We did a great deal in this field, a great deal because of problems of noise, although these youngsters don't seem to care about noise. Maybe in the future noise won't bother them. They won't be able to hear it or anything else. If they can stand this rock and roll

and some of this other stuff, why nothing that happens in a tank or on a battlefield is even going to upset them, if you can get them that far with a halter around their neck. We did a lot of work on that, trying to improve the comfort of our vehicles without getting into great luxuries and to get rid of protruberences that caused sore arms or scratched faces or black and blue bumps here and there. There is a lot more that could be done, there was a lot that was done, and there is a lot still to be done in that field.

We supported the Medical Department and I particularly supported the Dental Corps, who had never had any money for research to speak of. We finally gave them a research capability although much of it was done through commercial sources; you probably know yourself the tremendous advances we made in dentistry in these past years. We got the expansion through for the Walter Reed Institute for Army Research, where they do some very advanced work with respect not only to the brain but in every other part of man's anatomy that influences his motivation or his physical capabilities. We tried to push along that line.

We made several studies of industrial management trying to see if there are ways to improve our own. I know there are; there always will be ways to improve, because the situation is constantly changing whether it is in industry or otherwise.

I went to Gulf after I retired and had six years looking at industrial management and research from the civilian side, and both have their problems. They're not as dissimilar as they might sound. Support from the top is one of the things that is essential for adequate and competent research and development to go on. There has got to be some degree of enthusiasm or understanding or research falls by the way if you don't have that kind of support. And, of course, everywhere -- and this even exists among researchers themselves -- is resistance to change. Researchers may think they are looking for something, and they are, but if they find something new, they tend to resist any change in something they found new last year that might be changed this year. I don't mean to say they are all that way, but I will make the statement that in the research establishment there is resistance to change, and this I found particularly true in industry.

Of course, finally as my tour drew to a close I had some internal problems. I was still trying to speak when I could on the problems that involved the defense and security of our country, and my philosophy hadn't changed from earlier days. So during this time I became more and more anathema to Fulbright and some of the people in State. As a result some columnist wrote an article in the New York Times, and out of that came the "muzzling of the military hearings" in which Admiral Arleigh Burke and I seemed to be two of the prime victims.

We found that many of the speeches that we submitted for approval were being softened and they were taking any points of firmness out very frequently. I did try on two or three occasions, through the Army public information office, to find out who the individuals were who objected so that we could go and sit down with them and talk about their philosophy. None of that. You couldn't find out who they were and they really didn't want to talk to you. They wanted to turn it down, if they had authority, and that was that. We had our problems in this regard but I guess we all lived through it.

Q: I think the muzzling thing shouldn't be passed over too lightly. You did have support; I know that Senator Thurmond was your chief supporter. But the thing that I think is interesting is that it was actually the Pentagon that was muzzling the military, and Congress, in some cases, was coming to your assistance.

A: Yes, to some degree. I hadn't realized it, but most other officers had exceptions taken to a couple of their speeches. Burke has 7 and I find myself here with 27. But here is the kind of thing they'd pull on you: "I say nothing less will permit us to emerge victorious as the end of the century approaches," and this character, whoever he was, says, "Nothing less will permit us to achieve our goals as the end of the century approaches." Now there is not a thing about saying "emerge victorious" that says we have to wipe the Russians off the map to do it. But they will pull this stuff on you. This is one the censor wipes out: "Co-existence is not a choice. It is a fatal disease." He strikes that. Then this is interesting; it goes on to say, "Did Rudyard Kipling describe the cunning of our adversary when he said . . ." They changed that to read, "describe the cunning of an adversary." Actually, Kipling was talking about the

same threat that we were, the Russians: "This is the time to fear when he shows seeking quarter with paws like hands in prayer, that is the time of peril, the time of the truce of the Bear." I mean, this gets a little chicken, I think. This is interesting. I had forgotten about this particular presentation.

Q: I also found reprinted from the Citizen in March of 1962 a lot of humorous plays on censorship, Washington style. I think that you will recall it when I show it to you. I think that continues to show that you weren't one to sit back and not be heard. Perhaps we should talk about the fact that during the time you were in research and development, you gave 189 different speeches. If you figure that out over four years, that makes one per week, which is a pretty ambitious program.

You know, when you were G-2 in 1953-55 in Washington you departed suddenly and then you came back and all of a sudden you were a very tough spokesman for the military. As you describe the way you were building up the military complex and industry was becoming emotionally involved, it was a great relationship. I'm surprised that you were permitted to do this. Was there guidance from a controlling group with the military to get you to do that? Was this your own idea or what?

A: No, this was strictly my own idea. I was never urged by anybody. You mentioned that large number of speeches. There is a tremendous similarity among a great number of them. My pattern in making a speech was (and I finalized all my own speeches) I drafted some but I set the pattern for all of them and they were nobody else's but mine, although a lot of people did good work on them. My pattern was one-third that appealed to the local audiences, one-third that had to do with the general problems of Army research and development, and one-third that would deal with national security. If you look at my talks, while they may not spell this out in relative number of pages, that was the pattern of them all. So over any period of several months the pattern of the middle third would be as to where we were and what we were doing in R&D. The pattern of the front or the first third would be modified in every case to appeal to the audience and the locale or the atmosphere in which I was giving the talk. The last third you will find, by and large, was quite standard in many cases because it was always to a different audience and could be

repeated. Furthermore, I wanted to hammer home the same theme that nothing in the threat had changed; that the Russians were the same as they were before, that their intent was the same, that peaceful coexistence meant coaxful nonresistance if they could talk us into it and wipe us out. That peace, as far as they are concerned -- as defined by Marx -- is a condition that can only exist in a classless society, whereas peace to us is something else. To us it is a condition that exists when there is no threat of revolution from within or aggression from without. This is what peace really is. We haven't had any and we are not going to have any unless you accept the Russian's definition. Then if you do -- of a classless society -- you've just given in to it all. And, of course, Marx says that in order to get to that objective the end justifies the means; that is the other point.

I've done what I felt I needed to do and I would do it again. While I don't go around making many speeches these days, I still feel the same as I did then. I'm amazed at the apathy of our people, the condition that we've let our country get into, the atmosphere of anxiety and fear under which we live without faith in any religion or a belief in anything greater than ourselves, or any attempt to live up to the ideals that made our country great. I feel just as firmly about those as I ever did, but more worried.

Q: I'm sure you have a lot of followers and I think we need you to be heard again. General, I've got a lot more things to talk about. Let's talk about guerrilla warfare. I know that you are a prime mover of the program, and I think we need to talk about it.

A: Well, I recognized that something needed to be done in this field, as I told you; this is dated 1961. I had been to Vietnam the year before; I had been trying to set up a quick reactions laboratory, a limited warfare laboratory, because you could see all the time that we had been thinking of general war developing and we got caught with our pants down in Korea and again in Vietnam. It is because of this that we've appeared, even more than is true, to have an inequitable way of handling our manpower, which is the more sensitive area because it wasn't general mobilization. We are still paying the price for it, more and more. You could see guerrilla warfare coming.

When I had the 1st Cavalry Division on Hokkaido, the first requirement I had for that division (and they had only been away from the front for a matter of months) was to take the 8th Cavalry back to Hokkaido and the region between Taegu and Pusan where there was heavy guerrilla action in late 1952, believe it or not. This may not be recognized. Many of our dumps and other installations were in danger. This was at the same time or about the same time that things happened down at Koji-do; you remember the prisoners broke loose and they let them loose somewhere else and they had a hell of a mess. So this question of guerrilla warfare became a real question. Then when I got back to Korea as the Corps Commander, we had a couple of Koreans there who were real experts on guerrilla warfare. I remember getting copies of their doctrine and I think I sent them in to the Department of the Army, suggesting that they take a look. Perhaps even at the War College you might find one; I don't remember the Korean general who wrote them. I was impressed with this sort of thing breaking out. Then when I went to Vietnam -- as I say, I'd been there several times, 1954, 1956 and maybe again 1958 or 1960; anyhow at least three, probably five times -- it was then apparent that we were going to be fighting down there without any front lines, without any boundaries, and that you didn't know friend from foe. Of course, I told you I faced that to an extent even when I had the 7th Division. There were radio teams from the north looking down from the rear of my position and, in one case, even adjusting fire on us. So the threat of getting into a place like Southeast Asia, where there were two sides and where heavy Communist penetration was coming in, made it quite apparent that we were going to run into this. So I talked with certain people back in Washington in the early spring of 1961 and I said, "Give me some ideas on this." This paper in essence was given to me and then I did a little dressing it up. I thought finally we had gotten away from the idea that this had to be all-out war, that there would be no nuclear war. I'd been working for a couple of years to get them back to recognizing that conventional war would have its place. Then I thought I should move them into thinking about this and getting a limited war or quick reactions laboratory. I put a cover sheet on this after making a few other changes and published it through my office. As you see, the paper is relatively innocuous. I sent it out as shown here: the Deputy Chiefs of Staff, Continental Army Command, Technical Services, their R&D chiefs, and the heads of

OCRD field activities. There was no reason to classify it; it is a simple document setting forth some facts. Well, the first thing I knew this hit the fan and it came out in the Armed Forces Journal. Then people began to ask some questions, and the first thing I knew I was asked to go down on a plane with Lemnitzer and Rostow, who was in the White House. We went down to see what they were doing at Bragg, and Rostow had a copy of this paper. He asked me about it and I told him, I said, "This is what we are heading into. We have to get with it". In any event, Taylor went down about this time and made another visit to Southeast Asia, and I guess when he came back maybe they were convinced. So they started getting with it. It took me another year, though, to get this limited war laboratory started. The minute this was sensed, a certain chap came down from ARPA. (I think he later went to jail for misappropriating or misusing some funds on a trip down there.) He insisted that this was bigger than Army business and was going to be taken over by DOD and he was going down to set it up. I guess he did, but back in the Pentagon it was recognized that maybe the Army had the primary responsibility although, surprisingly, the Air Force said this was right down their alley. How the hell you fight guerrilla warfare from the air wasn't clear to me, but they put a lot of heat on this and they were going to build this kind of team and that, and I guess they did; maybe they have all been needed, I don't know. In any event, we finally got a limited warfare laboratory at Aberdeen; I think we've done a lot of good in it.

Q: General, you have been involved in just about everything. You did things for people, you did things for equipment, you did things for tactics; you attempted to awaken the nation.

A: Maybe somebody can one of these days. Maybe at the wrong end of a bomb.

Q: Your reputation got so good that all of a sudden, with Dulles leaving the CIA, I noted that you were being considered, I think even at a high level, for the position as CIA Director. And then Cabell, the Assistant Director at the CIA, was leaving and you were very seriously considered for the number-two job because McCone got the number-one job. Would you like to comment on that?

A: Well, I was asked if I would take it. This would have been in the fall of 1961. I said I would take any job where I really felt I could serve my country but I didn't think the appointment could be made because I knew the power of the opposition and it went very deep. I didn't have any misapprehension about this but I said I'd keep myself in the clear for a few months. So two members of Congress -- important members of Congress -- talked to me about it and I said I expected to do other things, but if I was really called upon and felt I had the right support in the right places and adequate authority to do the job, and to bring in some people of my own choosing (because you can't operate entirely in somebody else's atmosphere), that I would consider. Well, that never came to pass. One day after Mr. McCone was appointed, he and I played golf at Burning Tree. We just happened to, as far as I know. Maybe somebody else arranged this cleverly -- could be; you never know. But, anyhow, we were in the same foursome so we talked for 18 holes; make it 19. I wasn't sure he knew all the background. He told me that I was going with him. I said to him, "Let me tell you what happened before here." So during the round I told him the whole story and I said, "The reason I'm telling you this is, in the first place you ought to know that this condition exists, although I think somebody else would be damn sure that you do." I said, "Furthermore, I want to say now that, despite the fact that you are going to be appointed director of the CIA, I don't think you can get me appointed." "Oh," he said, "I can take care of that when I come back." He said, "I'm going to London tomorrow to take a look at this thing." He went to London, and during his whole trip he was actually guided by the man who put me on the spot six years before. So I thought, good God! You know, things to laugh about! I knew then that they couldn't have assigned anybody as his guide who would have been as sure to condemn me every minute and from every damn angle he could think about. So that was that. We've never mentioned it from that date on, McCone and myself. He is a fine person; I could have worked with him and enjoyed it. I would have had to work a hell of a lot harder and for a lot less money, I might say, than what was in the wind. But if he had wanted me and the country had wanted me, I would have gone. As it was, I was holding off the Gulf Oil Corporation at that time; the Chairman had been waiting. He not only had been looking for a man for

six months to head up research for the Gulf Oil Corporation, but he then waited for me to make up my mind from December until June.

I hadn't committed myself, but I had a pretty fair number of opportunities. I decided first I was not going with a defense industry and be utilized that way; second, I probably would go with an independent industry; and third, I had decided years before that wherever I went I would not go to Pittsburgh. Well, that shows you how wrong a man can be. I did a lot of thinking about this and I talked to my friend K. T. Keller down in Florida around Christmastime that year and with some others. In any event, I ended up taking it. It was a very satisfying job. I took it for five years, which would take me to a retirement age of 65. I was well treated; I had lots of responsibility; I had lots of good friends and made a lot more. I was in a field that, as you know, had intrigued me for more than 15 years. This field of oil is a number one factor in the world strategy as well as economy in the power struggle that exists, and when the five years was up the chairman said, "I wish you would stay with us another year," so I did. It was a very satisfying experience and it gave me a beautiful chance to spend a whole decade looking at this field of research and development, engineering, production, procurement regulations. I spent half of it looking at it from the government side and half of it from the industry side. Fascinating, fascinating. But you can see why I didn't get in the CIA. I was not looking for it. I wouldn't have lifted a finger to get the job myself, but I could have done a real job there.

Q: There were a lot of people predicting that you would get the job at the time. You know, to go back to May 1961, everybody knew General Art Trudeau. It says here that Robert Allen and Paul Scott, reporting in the Northern Virginia Sun, stated that JFK planned a personal Chief of Staff and that he had indicated that you had a chance at that job. I thought that was very interesting.

A: That is very interesting. Well, I hardly knew Kennedy and I can tell you now that the coterie around him would have killed me off, too; you couldn't break through that coterie, and I'm neither a political liberal nor a Democrat. I told you before, or maybe I didn't, that he told a certain top industrialist in this country -- and I mean top -- to pick out and designate for him the new head of the Agency for International Development. Well, you've got those

reports I handed to you today, which you haven't read yet. You saw that folder on civic action in Latin America, which I knew a lot about, starting there and in OCB. This individual called me and asked me for lunch at the Mayflower one day; the year would have been the fall of 1961 before I retired. He said that he had been talking with several other men who were also top men in industry that knew me, and they had unanimously agreed that I was the man to handle that job. He wanted to know if I would accept it since he had an appointment with the President that afternoon. And he did have it! He had the appointment with the President and he called me back from New York about 24 or 48 hours later and said, "I'm sorry to tell you that despite all the promises that I would name the man and all the endorsements that you had, the President has telephoned me that his staff thinks it would be quite inadvisable to have a man with your military background in charge of the Agency for International Development." So that ended that. So the power of these staffs around the President is very, very great; they are hard to break through. I mean, if you could establish your outguard around your position with that strong a defense against, say, a Chinese penetration, you would always be a winner. But maybe that's the way it has to be; I don't know.

Q: General, in research were you looking at the laser?

A: Oh yes, you bet we were looking at the laser. We looked at tactical nuclear weapons, conventional ground weapons of all sorts, and the laser. Also its uses in passive light devices were very apparent. It takes eight or ten years to bring many of these things to fruition. With the McNamara system they put the projects up for bid after each step. In other words, a company could win the successful feasibility design and somebody else could then come in and bid on the R&D and build a successful prototype. And then somebody else could come in and win the production contract. Nobody makes any money on the early stages, on the R&D; they are looking for the production contract to do well at all, to really bring to fruition the things that they develop. McNamara destroyed that system and he permitted other companies to come in and underbid them. Then we would lose the time and delay by somebody getting in that didn't really know what the hell he was doing, and the first thing that new company had to do was to go and proselyte the men away from the unsuccessful bidder,

had to proselyte away the men that knew how to do the work. So you had delay, you had increased costs. I don't say you can just give one contractor his head and let him go. I know you can't. I know you can analyze estimates if you've got the people who know how to do it right, step by step with him. The new system that is being brought in is called "Should Cost" estimates. This means that they are going to analyze fixed-price contracts and certainly incentive-type contracts or cost-plus types and, step by step, the government is going to compare estimates with the contractor and check his costs and then come up with an estimate and say alright, this is what it should cost. Now in the Army Engineers, on that type of construction, we always made government estimates and we always expected the contractor to come out somewhere close to us. Certainly by now the procurement load is decreasing and more people have been trained in this game. We ought to have people in government who know how to price out a contract and make an estimate. It is high time we develop that technique. I know there is a lot of discussion in the Pentagon now. I hope that while we are not going to revert to what we had before, we will go to a more equitable system that will still enable this terrible lead time -- anywhere from 8 to 12 years -- to be cut down to 5 or 6. We've proven that we could do it; in some cases in the limited war laboratory they said, "We need this; you could use this in the jungle." Hell, in a few months we came up with it. Now I don't mean you can come up with a new satellite in six months, but it is quite obvious that we can do a better job than what we have done under the present procurement regulations or ASPRs.

Q: There does seem to be a pendulum now effecting concurrency; buying time versus fly-before-you-buy. In your view, where is the proper mix?

A: Well, the proper mix is this: first, a project manager who is really knowledgeable about what he is doing. I know that the Army is going to train more project managers in this area where they are still short, apparently by sending some colonels and lieutenant colonels to take a course at Harvard Business School. Well, this will be a big help in time. The Sloan School of Management might be just as good at MIT. They've done more work in analyzing government contracts, I think, than Harvard has. But let's say that either school is good. Then it comes down to the qualifications of the individual. Now I raised this

question at a recent meeting because, if you are looking at it from the procurement side, you're going to get the kind of man who can flyspeck a specification, both in preparing it, interpreting it, and in seeing that the customer lives up to the specifications. This may be perfectly good, although you can hire a lawyer who isn't the project manager to do it. What I maintain is that the man who is going to do this job is like the commander who is fighting a division; he should know how to fight a division. In other words, the man that is going to do this job should understand at least the technology of what he is going to be involved in. Nobody can understand the technology of all things mechanical, electrical, and chemical. I admit that, but this man should have an adequate technical knowledge and a breadth of knowledge and/or experience in this field so that he really knows what the hell he is doing. He cannot just be administering a piece of paper. That's my point, and that bothers me because I think the tendency is to get a project manager who is more acquainted or more directed toward the cost problems. It is difficult, if not impossible, to find any individual who can prepare or defend cost estimates against the battery of trained specialists available to any large corporation. What I'm saying about the project manager is that I think he should be sufficiently knowledgeable -- with respect to the systems and, in general, the technology involved -- to really understand what is going on. Otherwise, there may be points, particularly in the R&D cycle, where he could be at a loss as far as making a prompt and correct decision.

When you get to the other part, the procurement cycle, then frequently it is the interpretation of the contract that becomes more important than the technology involved. This is my point here. I think some sort of concurrency is necessary. There are none of these jumps today that are as great as the ones that had to be made during the stage of early missile development. This had to do with inertial guidance, motors, materials, communications, photography; you name it, and it was all there. All of this was, in effect, being done concurrently with the result that the system had come under considerable fire, particularly during the McNamara regime. The end product was frequently delayed with large cost overruns because of failure to produce critical components or sub-systems in a timely manner. They all came through eventually, but this did cause some

delay. I'm not sure but what the overruns and costs today, by dragged out procurement on the grounds that every component has to be completed or perfected before you can put it together, is just as costly. I do know that the system that we have today ensures a certain degree of obsolescence in some of the components, if not in the system itself; it's bound to. So we've got to be careful when we talk about concurrency as against fly-before-buy and if what we are doing isn't really reaching back to die before fly. That's exactly what I mean, and I'm concerned about this one.

Q: I'm going to ask some specific questions. Some of them may go into detail, and some not. What percentage of the Army's budget do you think should be preserved for R&D, and, within that, how much of your R&D budget should go to basic research?

A: I think that while last year things were getting low, the budget contemplated for 1972 is a reasonable one. While there may be some increase next year, depending upon whether it is decided certain new weapon systems should get under way or not, it is not too unsatisfactory. The question of basic research is very important; there's no doubt about it. On the other hand, the money that's needed for basic research is only a fraction of the moneys that are needed for advance research or, even leaving that as research, a fraction of the moneys needed for development, particularly prototype production, testing and evaluation and bringing it to the point of full procurement. By and large, you're dealing today with equipment that is on hand. Ten or 12 years ago you could buy a new piece of equipment and 6 months later something so much better would be available that you'd find yourself just buying equipment all of the time. This is not true today. I don't say things aren't changing, but not with that degree of rapidity. So what you're paying for is really manpower in basic research, by and large, as against the tremendous cost of prototype production when you get into applied engineering. I think we can handle that all right.

I want to mention something here that I had occasion to write a letter about to Business Week just a couple of weeks ago. An outfit like Bell Laboratories is one of the great research establishments in the world; no question about it. They have put together a combined organization in Denver that has people on basic research and applied engineering, in other words, up

to prototype production and marketing, all working as a team together. Now this is new. I wrote Business Week a letter just three weeks ago, but I don't think I have a copy of it here. Dr. Edward Teller was and is a good friend, and has been an acquaintance of mine since I took over the R&D job some 13 years ago. He spoke to me about this subject several times. The subject is applied engineering and I merely want to mention one action of his to show how important he considers it.

About 1964 I was the President of the American Ordnance Association and President of Gulf Research and Development. Edward had spoken about this (applied engineering) on several occasions when I had been at Livermore recently. I had invited him to be the speaker at our annual luncheon with the people who were going to be at the head table. These were the leaders of American industry -- many of them, maybe 40 of them -- and some military. Even though it was a cocktail hour, Dr. Teller said to me, "General, could I talk to these people a few minutes? I'd like to make them understand the importance of applied engineering." I said yes, so I rapped on a glass and got the attention of this crowd who were enjoying themselves and having a drink before luncheon. Teller spoke to them. Of course, everybody is impressed with Dr. Teller; he's a great person, he's a wonderful scientist, he's a great personality, and when he talks people listen and they should. The essence of Dr. Teller's talk to these people was, "I've asked General Trudeau to give me just a few minutes here because I want to accent to you the extreme importance to American industry of applied engineering. What we're doing today is inadequate. We've got to train more people in our universities and colleges in the field of applied engineering. Because while I, as a scientist, am worried about basic research, we're in a far better position today in basic research than we are in people who understand applied engineering and can put that basic research to work in something that really serves man."

He made his point. He was urging them to assist engineering education. This is why now, seven years later, even the Bell Laboratories, which have never done anything but basic research, have had to put a team together that brings in applied engineering -- to put some of their new ideas and concepts to work, and their production and marketing men, to see where the

so for you to drive until you get a car." Whereupon I replied that I knew I'd be coming back here and would be dealing with all of the companies in the automotive industry, and I didn't think I should show a preference so I bought a Mercedes Benz. Well, they got a big kick out of that and, of course, that is exactly what I had done and I've been driving one ever since. Our industry has never gotten around to building a medium-weight and size, high-quality automobile, and what a price we've paid.

In any event it was probably in March -- although my records are not here -- when Explorer II was fired into orbit. I went down to Canaveral with Secretary Brucker. We were in a great competition with the Air Force at that time. Our Explorers were Jupiter missiles that were based on the basic Redstone element with a liquid-fuel, rocket-dyne motor. The Air Force went in for the Thor missile, a solid fuel motor, as a competitor. We felt ours was better. Whether it was or not, there is no question but that the two were in direct competition. We had been successful; we had gone into space and we saw the potential of this missile. One of the places where we differed was where we believed in a principle called ablation. In other words, we made the surface of our nose cone out of a certain kind of plastic or ceramic that did melt away slowly and would absorb the tremendous heat, but at such a slow rate that it didn't damage the structure. The Air Force, on the other hand, with Thor tried to go by a principle called "heat-sink," where they tried to get a metal that would still function as a metal but absorb this fantastic heat caused by the speed of going into orbit, which is 18,000 miles an hour, or 5 miles a second. There was great competition in those times and actually on the day that I took over (April 1, 1958) I started getting acquainted with the Nike system. This was to be Nike Zeus.

Now we had Nike Ajax, which had come into being in 1952; there was great opposition to putting Ajax into production. This missile was for knocking down lower-level aircraft up to maybe 40,000 feet, which was considered high for an aircraft in those days. Finally it took a man, a practical man like Mr. K. T. Keller, who had been the head of Chevrolet and later of Chrysler -- a great person -- to get action. He was called in by President Truman during the Korean War to really ride herd on industry because he knew how to move things. Finally, with great opposition against

hell it can be sold. This is a new concept, but it's been coming and it's here.

Q: How do you feel about procurement of foreign military equipment for our forces -- major items, or even subsystems?

A: I don't object as long as it is U.S. production. No foreign-developed system should be purchased exclusively from a foreign country because of the difficulties in overseas transportation in time of war. Any item that is good enough, any system that is better than what we've developed in America, should be adopted if an American firm can be licensed, and obviously pay royalties on production, to build that product in the United States. The first buy in the interest of time might be procured from the foreign country, if it meets all American requirements, while we are tooling up and getting the special machinery needed for U.S. production. Now, by not doing this, we are at the point where British industry is falling apart, and the same in some of the other foreign industries. In the interest of NATO and the Free World of the West, we should have had a joint requirement established at the SHAPE level 'way back; I tried to get this done in the early 1960s. Establish a joint requirement for a system, whatever it is, and then the production should have been apportioned out, not exclusively to America, but to some of our allies. The only effort in this regard was with the Hawk missile system where a grouping, a syndicate, was put together where certain components were produced in one country and certain in another. It has been the only way to keep technology alive in these countries and now it's falling apart. If we don't do something about it . . . it may be too late. The British aircraft industry will be down to nothing. What is the British Empire unless they can produce and sell? They are not self-supporting; they can't even feed themselves. Who will they sell to unless their technology is advanced, and of course, they've been their own worst enemies, because their industry is so inefficient. Their management and their production per man per day per dollar is better, but still low. We need to keep our people at work, too, and of course this is the struggle that goes on between men and nations that got us right where we are today.

Take the HS 820-millimeter machine gun. The United States made an agreement with Hispano-Suiza. They

were going to license a company they were going to form in the United States for U.S. production. It could have been licensed to somebody like Smith and Wesson or Maremont or General Electric. In the overall government agreement (government-to-government, in other words) they went from their government to our government to a contractor. We are talking about the procurement setup that was arranged. The arrangement was that the first buy of so many hundred guns would be produced by Hispano-Suiza and shipped to this country. In the meantime, an agreement was to be made with some firm to be licensed. HS will be paid so much of a royalty on future production, and during the period of the first buy and the first shipment we'll tool up in the United States. The second buy and from thereon will be U.S. production. HS is furnishing that gun to the German forces. She makes it in Britian, and the British are using it. Wherever she had contracts with associates of ours, she would still be producing from there, but the standards and means of production would be ours over here as far as metals and tolerances are concerned.

One of the points that is unsettled, and quite unsettled, is this: Let's say we go to country A who is producing Weapon System B, or whatever that is, or Military System B; maybe it's communications and not weapons. All right, how do we arrange for U.S. production? Well, ideally, the United States would like to have at least three companies who would bid on it. But what are they bidding on unless they're informed as to what is to be produced? How can they be informed unless the arrangements somewhere are made so that Company A in France says, "All right, I'll be willing to license these three companies in the United States." Then the companies have got to say, "We'll accept the license, and we'll pay you so much for the license, and so much royalty per unit on U.S. production." Well, now how do you get to that point? In other words, there may be many cases where the government of France will say that anything that goes out of France has to be cleared on a government-to-government basis. And so this Company A in France says to their government representative, their DOD, "All right, yes, we'd like to license that to the United States if they'll give us $20 million for a license and a five percent royalty." The government of France and the Department of Defense may say, "All right, we'll do that," and that's accepted in the

dealing. Then one of these three companies bids for it and gets it.

Another way, of course, is for the company in France to say, "The company we really want to work with in the United States is the Z Company," and they offer a license to the Z Company, and say, "If you can get a contract, we'll let you build it for such and such a fee and such a royalty per unit." Then our government has got to decide whether this is going to go through as a negotiated bid, or whether they're still going to decide on competition. If they decide on competition and the company in France wants Company Z in the United States to build it, all they've got to do is to raise their license and royalty price to Companies X and Y in the United States, and Company Z is going to get it anyway. Now, with a sure-cost type estimate where they can check out each of these items and sit down with Company Z, the government can, with the company in France, analyze this and that item. They can say, "Yes, this is right or this is too high. We're going to audit it; we're going to give you an audit on each item." But it certainly can be worked out.

The biggest opposition to this is going to come from companies M and N in the United States who are producing competing weapons systems. They'll say, "You can't go outside of the United States to get this." But then the successful U.S. company would say, "Yes, but we're going to produce it in the United States, and we'll be using as many men as you are." And then you get three senators in the fight.

Q: General, I probably shouldn't even ask the question, but do you think that you were running R&D or was it running you?

A: Fifty-fifty.

Q: You don't think it's going to change, either, do you?

A: Not really. There's too much power down below that's really distributed through the system. It goes all the way back to not only the service involved but to the officer directing the plan and contract management. It goes back to a project manager and the key civilians under them. It also involves the company representative who is selling the program; I know many of the top ones. OCRD is not where the work is done mostly, only the coordination. The work is

done down below; it's done with the project officer, the company representative and in other places; I have no misconception about that. I could organize policy, I could make a lot of improvements, and I could direct certain things to be done. I could limit the activities in some ways in some of the then technical services, but I have no illusions that the man at the top can really control it all, any more than the division commander can control all of the platoon actions in battle; I mean it's the same thing.

Q: We've talked about the manager, but how much latitude do you think the military manager should have in creating his own team? What I'm thinking of here is personnel he has known previously, and has confidence in, as opposed to just having them assigned; you know, qualified people assigned from personnel.

A: Now you ask a very good question. Again, my answer to that would be it depends almost entirely on how much he really knows about the business he's going to supervise. Is he just an administrator trying to keep his ducks in a row, or does he really know what the hell is going on? In other words, there are many different situations and I've been in them myself. For instance, I took a team overseas during the war and I needed an officer from each of the technical services. It was the job that I told you about in reconstituting the 2d Cavalry Division, which was a negro ex-Cavalry Infantry-type division, and forming some 130 units from these battalions as service troops. Do I want to take nine people with me from these battalions as service troops? Or do I want to take nine people with me that can always get the job done? Only to a certain extent; maybe a few. But I wanted one officer from every Chief of Technical Service whom he and I both had confidence in. I went to the Chiefs and said, "This is the job; we're going to take so many troops and we're going to make 18 different Quartermaster-type units. Give me a man who really knows your organization, your TO&E, your training problem." And they come through and give you one. I've seen it many times in G-2 where I wanted the right man. If I wanted a man who was an expert in a language, for instance, it makes far more sense to go to your personnel people and say, "Give me a man who really knows two or three languages, like Dick Walters." I am not unwilling to lean on people when it comes to selecting specialists, and I think they often do better than you do yourself. As a matter of fact, I'm not sure but what many officers would have

been better off, instead of trying to staff their staff with their old friends or buddies or drinking companions -- or their wife would say, "You remember, Tom's such a nice guy, you ought to find a spot for him." I'm not sure but what you would always do better to let a good personnel section, at whatever level it is, pick your man for you because if you don't like him, you can fire him and preferably before it's too late. I knew a senior commander during the war who really paid the price because he picked the wrong man for his number two, for his Chief of Staff. You need more than old friends and relatives around you when the going is tough.

Q: General, we mentioned ARPA, the Advanced Research Projects Agency, before. I don't have the dates that it started but it was around your time.

A: It was, yes. ARPA began in 1960-61. Dr. Herbert York had it first before they formalized the Deputy Director of Defense for Research and Engineering (DDR&E). They had a couple of people fighting for power at the Defense level as to who would decide this and who would decide that, and they finally appointed him. When they gave him that title, he was to be senior to all assistant secretaries and directly behind the Deputy Secretary. That is the law today, and York was the first one.

The Defense Department had quite a problem because the scientific community felt they weren't getting enough pay from the government, so the government was hiring them by contract through this Institute of Defense Analysis that was organized and headed by General Jim McCormack, who was a vice president on leave from MIT, a former Army Engineer and a protege of mine at one time. He retired from the Air Force as a major general and he recently retired as chairman of COMSAT. Anyhow, the scientific community wasn't satisfied with government salaries as they were then and I guess they are today. As a matter of fact, it's better than a hell of a lot of them are going to get on the outside. Unfortunately, I'm not saying that with any satisfaction. I hate like hell to see what's going on here but, in any event, the big problem for York was that he came in to run ARPA. He was hired by contract through the Institute of Defense Analysis at a salary about twice as great as he could have gotten from a senior GS civil service position. One of the reasons for his great hesitancy, and I think it's understandable in going from ARPA to this new

Secretary's job, was that his pay was damn near cut in two; not quite, but way back. Now, of course, they've gotten the DOD pay structure up in the $30,000 to $38,000 bracket. Of course, this is another problem with inflation in this country. A lot of this inflation has been caused by the fact that with the demand for people in the expansion in the late fifties and early sixties and cost plus type contracts, industry could go out and pay any damn thing they wanted to anybody. Then if they saw somebody over in the other fellow's company, they could hire him away, you see, for $5,000 more a year. These prices got out of all range of anything else, which again reacted against keeping people on the campus. This also reacted on the kids, because the students got little attention on the campus, by and large, because the professors were either consulting or writing books. They really made money, so this is part of the kids' feelings on campuses that they don't belong; they couldn't identify with anybody. They had big halfhearted lectures given to them. The men of real competence that stood out would hardly teach them. If they taught a couple of hours a week, they were doing well. So then you got this struggle for higher salaries on the campus, you see, and then you got higher salaries in industry and then you got more inflation. You got the same thing applied to the technician and then organized labor. And so you're where you are today; you can't afford to educate your kids and the scientists cost so much companies can't afford to hire them unless they get a big contract. We walked right into this; you could see it coming.

Q: What do you see as the future role of ARPA?

A: Not as a very great establishment, I wouldn't say. If there are ideas coming up in basic research -- I'd say with status, the rated status of basic research in the three services today -- I think the service in question probably has more persons knowledgeable as to what use could be made of scientific breakthrough than the few people up in ARPA do. It seems to me they'd have to send an idea to some service to examine it in most cases. Maybe they should be able to brief the service, or perhaps there should be a coordinating agency, again to prevent unnecessary duplication in fields of real new basic research.

Q: We have a question in regard to Congress. Inconsistent funding by Congress has caused inefficiency in the management of some major programs.

Do you think this could be alleviated by two-year appropriations approved by Congress?

A: I don't know. The fact is that a program can't be funded until it has been authorized. I don't know what to say. It could be helpful. Of course, the longer the appropriation is for, probably the better, and yet if I get $1 million this year for a project -- and it's a substantial project -- I would have spent $300,000 of it this year, about $580,000 next year, and about $120,000 the third year. In other words, the expenditures on an appropriation made this year are about 30 percent the first year, about 58 percent the second, and about 12 percent the third year. That's interesting and that shows the impact. If you cut off the appropriation for a particular year, what are you cutting off, the 30 percent, or 58 percent, or 12 percent? If this is the second year it's in, you're cutting off 58 percent of what they hopefully would spend there.

Q: You've done a lot of testifying while you were in the service and even after you got out. How important do you think is the ability to testify in the selection of Deputy Chiefs of Staff?

A: I think it's important that they be able to do so, but with respect to their selection, I doubt if much consideration is given to that. Any officer who's going to talk before high-powered groups should be a salesman in his own right. It's a selling job, there's no question about it. You sell yourself, and you sell your product, and you sell your organization any time that you're going up to get something done. I think the military are uniquely prepared. We've been exposed all of the time since we were second lieutenants, telling the recruits and our troops what the hell to do, you know. All of the time we're training, we're teaching, we're having this kind of an impact on other people. No, I think, by and large, the senior officers of the military are very well qualified in this respect. But remember only a small fraction of the Officer Corps, even general officers, are ever chosen for duty in the Pentagon.

Q: Along the same line, can you provide any insights perhaps from the amount of exposure you've had with Congress? Are there any do's and don't's as far as testifying?

A: I don't think so, unless you know a congressman's strength or weakness, or his enthusiasm to do something or to concentrate on some area. If he starts bothering you about certain things, then if you can divert his attention to whatever hobbyhorse he's driving, you can sometimes get him off your back. I've seen that work a couple of times.

Q: I might have told you that I went before Congress last year on budget, and Danny Flood is in the House Appropriations. Congressman Flood's from my home town, and that was just beautiful. Once we established a rapport, just the fact that we were from the same home town made a big difference in the way he treated me and everybody else in the hearings.

A: That's funny that you'd pick on him, because he's one man that is amenable to this approach I'm talking to you about. The reason he is is because one thing that's anathema to him are the competing military hospitals in Panama and you can really get him red right up the back of the neck by any mention of them. He'll spend the next half hour on that. By that time somebody else has taken up the cudgel and you're off the hook. That's funny that you would mention Flood, because he rode this hobbyhorse for two or three years to my knowledge and that was always the trick everyone used. He was pretty caustic but I never was badly treated by any of those fellows and I always treated them very respectfully. I always answered them as straightforwardly and sincerely as I could. I think that they knew that. I never really tried to pull anything on them, except that I diverted their line of thought a few times.

I think Army officers ought to visit their congressmen with the idea of apprising them of the Army's functions, organizations, and problems, particularly in these days where we've got so many young fellows being elected and so many of them have odd ideas. I think our senior officers, by virtue of their age and experience, could have quite an impact on them. Unless the man is so anti-military that he wouldn't even welcome them, I think they might eventually come around to a better military view. We should not only build up our friends in Congress but build up their alter egos, their counsel and administrative assistants. The administrative assistants are really the ones who tell the congressmen when and what . . . I don't mean dictate; you understand what I mean. But if an administrative assistant makes a suggestion that

the senator would talk with you -- give you about 20 minutes -- and you've got an interesting subject to talk about the day after tommorow, he's probably going to do it. The other point with respect to the counsel is that they are, in effect, the legal staff for all of these hearings. They're very sharp fellows and they like to impress their boss, usually the chairman of the committee. So give them a chance to do that and sometimes it'll get them off your back too; it'll make them a little bigger and a little better. They want to look good.

Q: General, we haven't talked too much about nuclear weapons, but they were an important thing during your last four years in the Army. What technological improvements do you see in the future for nuclear weapons?

A: They will be very important. Probably smaller size, as far as tactical nuclear weapons are concerned. There is no question but, what with the rocket assist, we can extend the range of our conventional guns and artillery by maybe 50 percent. We're having a hard time getting some people in government to see it; it's the NIH factor, "Not Invented Here." But we know how to do this and you put this together with terminal guidance and what we're going to have is rocket-assisted projectiles, gun type, with terminal guidance. Then put your forward observer at a point where he can put a laser beam on the target and pull that stuff right in. Whether we can live in the air under some of these conditions, everybody is wondering about . . . improved weapons of one type or another. There's some concern, as a matter of fact, whether helicopters can live within 10, 20, or even 30 miles of what we call the forward battle line, the FEBA. Now there's your question. As we were talking the other day about guerrilla warfare, it looks more and more to me as though we are going to the concept of naval warfare, I mean on a smaller scale, with islands of defense prepared for all-around defense; there just is no FEBA. So a longer-range missile, longer-range projectiles, are going to be important. I've always wanted to go farther with small nuclear weapons. As a matter of fact, you know, if these helicopters would come over an area where they're being fired on and drop one of these nuclear bombs about the size of a bucket, I think they'd slow down a hell of a lot of people who are shooting up at them. They have no way of doing this yet. All they can do is forward fire -- shoot out of the bow or sides -- but I'm not sure but

what we ought to be able to drop something out and down or propel it to the front or rear over an area where we are being fired on. What do we call the small nuclear bomb, the bucket job, you know? Davy Crockett. It's a sub-kiloton job and I've often thought about it just being dropped like a bucket of hot water out of a helicopter.

Q: That's a very interesting thought, very interesting. The Army was active at one time in nuclear power generation, reactors. We're out of business now.

A: Are we? I didn't know that. We built the prefabricated plant that we put in Greenland, of course, and then we've built a couple of barges with nuclear power plants on them. Then we built the 2-megowatt, 2000-kilowatt plant at Fort Belvoir.

Q: What was our idea of getting into the business to begin with?

A: Well, the Army's supposed to furnish power during war, and we thought that a nuclear power plant made a lot of sense. As a matter of fact, we were very much concerned in R&D about the ability to put down a nuclear power plant overseas; you can envision the situation in the Atlantic where we can't haul the oil across because of submarine threats and so forth. Where do you get your power, and, of course, that brought up the question of where the hell do we get our fuel for ourselves? We could see the need for the development, and that's why we contracted with a couple of firms to develop batteries that could be charged and recharged, liquid metal batteries, for instance. We were going to recharge them at a nuclear power plant and then have various other places where we could also charge them. You might have to take out your whole battery every 200 miles along the highway. It's not the easiest thing to recommend, but we didn't know what we might get into. This has gone quite a long way toward helping to develop electric drive.

Q: Are there any lessons that we in the Army could learn from the Atomic Energy Commission procedures or organization? What was the early relationship between AEC and DOD?

A: I don't know exactly. I was once offered that job as a military liaison officer with AEC but I didn't take it. I read the charter about 1947. I read the

charter for the job, and it seemed to me rather hopeless, because it was to urge, to encourage, and a few other things of that sort; you know, no teeth in the damn thing. We went over there without any authority. I think the AEC has done pretty well, together with Sandia and the other projects we've had in WESEG. I wouldn't say that the military position, with respect to nuclear weapons, has been held back too much by AEC. I think they've been pretty cooperative. Now, they occasionally have had a man on the commission, one of the four or five, who is quite anti-military. I think they have one at the moment and I think we lost one of our best friends when Ted Thompson was drowned out there at Salt Lake or Boulder Dam, or wherever it was just a couple of months ago. He was a great person.

Q: Sir, I've got a whole batch of questions that I could ask you, but I think we have covered a range here on R&D. Let me go back to Cuba and the missiles in Cuba, and perhaps the prologue to the crises. How were you involved? I know there were paper reports that said you had warning of this.

A: Well, we had, for one reason or another. I was knowledgeable from, I guess, the early summer or fall of 1961, that there was what I would have called ample evidence. Some people didn't consider it so, or didn't want the problem surfaced; but we did urge that attention be paid to the problem and called attention to the fact that our intelligence was showing that this was happening down there. It was certainly a badly mishandled situation.

Q: Actually it goes back to 1960. On August 2, 1960, a whole series of papers said, "General Arthur G. Trudeau said that there was no question that Russia had mobile missiles that could be fired on such cities as Charleston, New Orleans, and Houston . . . .

A: I tried to get the public to understand that this didn't have to be something with great big towers. They got the idea that for anything of this sort you've got to have a great big tower because they've seen ours at Canaveral. They don't realize that they have mobile missiles on tractor or wheeled vehicles that can be taken underground, and all you've got to do is to survey in your control point, then bring them out, program your firing, and fire the goddam missile. You can do that in an hour or so and I used to mention that fact, because I knew what their range

was; their range was up to 1,100 miles or kilometers, I've forgotten which. I used to say that those missiles could reach . . . I put it this way, "New Orleans, Nashville, and Norfolk, and maybe Washington." I had just taken a compass and followed it around an 1,100-mile curve and hit about there for the euphemism I just said. But our public had the wrong idea. They got the picture that you had to have a great big tower that everybody can see. If you've got a theodolite, a north-seeking theodolite, you go out and survey in your zero point. You come out and anchor on that with your computer, and that's it.

Q: General, I'm going to switch gear. I want to talk about the Roosevelt lecture program, which occurred in 1959. Your series of lectures was entitled "Time, Tactics, and Technology." Would you like to describe the series, how you got selected, and essentially what came of it.

A: Well, I don't know. It was either Kermit Roosevelt or Mrs. Kermit Roosevelt who decided that better relationships between British and American military associates would be developed through this exchange of lectures. She set aside 500 pounds a year for this purpose, which then gave us $1,400 for whoever was going over. It was a two- or three-week job; I've forgotten what the schedule was. And it was rather favored that you take your wife with you, because there were many social engagements that went along with it. It was a truly delightful experience. I don't know why I was selected in particular -- I've forgotten who preceded me -- but many of our leaders have gone over to give these talks, and, of course, the same thing by the British. The Roosevelt fortunes in later years have not turned out to be quite as good, I guess, but in any event, the 500 pounds, or $1,400, is being made available now. I think that was to cover everything except basic transportation. This may give the list of people here. I thoroughly enjoyed it. I related these lectures one to the other. I tried to vary them in a way that would be of interest to the level of the audience because we were going from Camberly, the Staff College, up to the Royal Military College of Science; the schools were all at different levels. And, of course I should add the Imperial Defense College and Sandhurst, where there were only cadets. Our approach was all British. It was a great experience; I enjoyed it.

Q: I have a feeling that you were selected for this job because you had become, in a year and a half, a very outstanding speaker for the government, for the military. Another subject is the Freedom Foundation at Valley Forge, and I know that on 1 May 1961 you were there. What's your connection with the Freedom Foundation?

A: Well, I'd been interested in it for some time. Don Belding was one of the founders, certainly one of the great supporters. He passed away last year; he was a friend and acquaintance of mine. Perhaps it was through him that I met Dr. Kenneth Wells. By the time I was approaching retirement that was one of the opportunities that was suggested to me, that I go up there and live, understudy and take over from Admiral Stump, who was living there at the time and was in charge. I've always had a very pleasant relationship with Admiral Stumpf because, as I told you, he was the commander in the Pacific at the time I was General Lemnitzer's deputy in the Far East, when the two were consolidated. The admiral is a dry and crusty fellow, but he's a perfectly wonderful man and I've had a great respect and admiration for him. At that time I said that I would consider it, but that's all I said.

General Harold Johnson, former Chief of Staff, is now going to run the Freedom Foundation. I went up with my wife when they were going to dedicate a building given by Sears and Roebuck. I remember Dr. Wells apologized to me that he didn't have anything better than a little guest house. It was Washington's old powder house. He said, "It isn't much, but we've fixed it up a little bit, and that's where you and Mrs. Trudeau can stay unless you go to a motel around here." We said, "No, that'll be great, staying in Washington's old powder house," and we were quite amused by it. Those were the days when ladies felt they should wear hats, and Mrs. Trudeau didn't realize that there was going to be a ceremony the next morning. A bunch of people were coming up from Washington and we were going on to Philadelphia to see some friends after the ceremony was over in the morning. So she said, "Gee, I forgot my hat." So I said, "Well, I can take care of that. I'll call Sullins." He was back at my quarters. We were then living at Fort Myer. I said, "General Vittrup and some others are coming up by helicopter in the morning; I'll have Sullins take your hatbox over to him." So I called Sullins and I put my wife on the phone, and she said, "Sullins, please get out the box

with such and such a hat, take it over to General Vittrup and ask him to bring it up to me in the morning." Sullins said, "All right." So my wife, in her lighthearted way said, "and Sullins, you'll never guess where we're sleeping tonight." Sullins said, "No, Ma'am." My wife said, "We're sleeping in Washington's old powder house." I don't know what the hell that meant to Sullins, but he thought that over for a minute or so and said, "Well, pleasant dreams, Mrs. Trudeau." Maybe he thought she was going to be blown up.

Q: You mentioned General Vittrup earlier. We mentioned General Caraway. Wasn't Vittrup one of the people who was in Europe when you went over to talk about redeployment?

A: Yes, Vittrup was on General Devers's staff then and Caraway was also. Earlier they were preparing for the invasion of Italy and Caraway was there too. Vittrup was at the War College and also G-1 while I was Chief of Research and Development. We are close friends and played golf whenever we could.

Q: General, I think we've covered your time as Chief of Research and Development in great detail. We've talked a few times about offers being made and looking forward to another career -- perhaps not looking forward to it, but obviously it was coming near the end of your career, which did occur on June 30, 1962. I think that needs to be discussed and talked about.

A: Well, as I say, things were rather fluid for the six months or so preceding that time. You queried me about the CIA possibility, either as the Director or Deputy, and I responded to you on that. Then I got this invitation to visit Pittsburgh before Christmas 1961 from the chairman of the Gulf Oil Corporation. He said that he was going to have a Board of Directors meeting, and they would like to have a dinner for me. Would I come? Of course, I knew that I would be sized up for the job, as the initial approaches had been made. I set aside the date. Actually, I remember it happening to be just one week before Christmas, so it must have been about December 18. I flew out to Pittsburgh and was put in the top of the U.S. Steel Building where they had some special accommodations; that is, General Richard Mellon did. The directors were all present at dinner except General Mellon, who was away but was returning late

that night. I had a delightful dinner with these fine men. They asked me to make some remarks and I was in pretty good shape to do so because of my longtime interest in the oil business and, let's say, some slight knowledge of the Middle East, it's importance worldwide and where oil fits into world strategy as well as it's economy. Apparently that meeting went quite satisfactorily, and again I was reminded that General Mellon would be in about midnight. I was returned to my quarters, which were in one of the nice and very private clubs in Pittsburgh, not an open club. In the morning I had breakfast there in the suite with General Mellon. I had known him, not well, but I had known him before, and I knew that he thought reasonably well of me. General Somervell, my wartime commander, had offered me a position in a Mellon industry there years before. I think I mentioned also that Somervell was very helpful at the time we put the War College at Carlisle when we were planning the move in 1950. He again offered me a senior position in Pittsburgh industry. So General Mellon was not unaware of me. His right-hand man (who was the general counsel for T. Mellon and Sons, the governing body of the Mellon interest), Joe Hughes, was a civilian aide to the Army from Pittsburgh. I knew Joe Hughes as one of my close friends, and he has been ever since then, both he and his wife.

I knew that from the Mellon standpoint I probably had a reasonably good standing, but the Mellons are very quiet people and they don't like any publicity. I realized that he might have thought that I'd been talking too much. So I think one of the angles that he was really looking for was any admission or any statements I would make on my own part, not about the research job but about my, shall we say, willingness to not just use the job as a public forum. I assured him that I wouldn't. He didn't ask the question; he's too astute for that. But I was also astute enough to know that that was what was on his mind. I settled his mind on that.

Mind you, this is a week before Christmas. About January, Mr. Whiteford, the Chairman of the Board, called me up and said, "What about this?" and I said, "Well, they've got me over a barrel here," not knowing quite whether I am supposed to stay in government for this CIA job, which was still hanging fire. I said, "I really need more time on this." He said, "Well, come on out again before too long. I want to talk to you." I went out and he discussed matters very

frankly with me. He told me about the salary problems and other benefits and asked me if there was any part of it that was not adequate and, if so, to tell him frankly. I didn't push that; it was very good, let's say. Then, on top of it, he just made a slight additional offer as far as my retirement benefits were concerned. He said, "Now, goddamnit, you don't have any reason for not coming." "Well", I said, "I still got this little thing hanging over my head, but I will notify you; you certainly have a right to an answer on this, one way or another, and you've now been waiting four months for me, so I will call you back." So I got in touch with him and, to make a long story short, it was settled probably in May of 1962 that I'd go with them.

He said, "Now, come on out and we'll announce this, and then I want to finalize your letter of agreement, your contract." I set the date for the 12th of June. On that day they announced that I was retiring from the Army at the end of the month and would come to be President of Gulf Research. At 6:00 that evening, the Pittsburgh Chapter of the American Ordnance Association (of course, I tied this thing together) had a dinner at which I was the principal speaker. It made a rather perfect setup in that respect. We finalized the contract that day, and he said to me, "When will you be joining us?" I said, "Well, I'm going to Korea to retire." (I'll tell you a little piece at the end of this story.) I said, "I haven't had much vacation in really 10 to 15 years. I've never had a month off since we fought World War II. I thought I'd take a month or two and then join the organization." I think I said September, after Labor Day. He said, "Oh gosh, we need you now, but I can understand your position. However, your contract begins July 1st, so you come whenever you feel like you've had enough leave." I said, "Well, you really put me on the spot on that one. I do need a month. Let me have July, and I'll be here by the 1st of August." We shook hands on that, and off I went and gave the talk; the next morning I was on my way to Korea.

Now, this was interesting, because I told you about my service in Korea and the fact that I'd gone back there a number of times for various purposes. I had the bit put on me in Washington, and I'd been there four and a half years. I had known that there was no other job for me in the Army, and I accepted that. There was no problem; I was enjoying what I was doing and I stayed

with it. But I still retired a month before I had to for my own personal satisfaction; I mean, retiring on a voluntary basis instead of being forced to retire for age, which isn't much but it's that little difference that sometimes counts. Anyhow, I went to the Chief of Staff, or I guess the Vice Chief of Staff, and I said, "The one thing I want to do before I retire is to return to Korea. I'd like to have my retirement ceremony over there," because this parade ground business at Fort Myer leaves me cold. He gave me the okay. This was Barksdale Hamlett, a good friend of mine, now President of Norwich University, and so he gave me his okay. He'd generally been junior to me, but in those days the people were going by me on the promotion list like I was standing still; and I was. But, in any event, I made this plan. Then he came back and said, "You can't take an aide with you, because the Secretary doesn't feel that this is really essential." This was McNamara. I said, "All right, what the hell." Then they came back and said, "And you have to go tourist." Well, I thought, you can rub it in just so far. I said, "Oh hell, that's all right. I can afford to pay the difference if the government can't after 38 years, I can afford to pay the difference." Well, I guess that shamed them into letting me fly first-class. It's a long trip. Anyhow, I went over and had my retirement ceremony at my old headquarters. It was a great experience and I'm glad I did. I felt great satisfaction retiring with the corps and the division reviews from units I had commanded. It was far better than any ceremony Fort Myer could have offered me. I was gone about ten days, and my final retirement was on 30 June 1962. A couple days later my wife and I took off to Cape Cod for three weeks. We then returned to Pittsburgh and that's the story to the end of my career. The final party was given to me by my group and the OCRD. Of course, there were numerous other things that went on, various luncheons and things of this sort; we were very well treated. We went down to Belvoir which had, of course, been my first station, when OCRD gave me our last party and they had movies made up with the story of my life.

Q: General, it's a distinguished career, and I wonder if you'd like to close this session with perhaps some reflections. You've been reflecting the whole time, but is there anything specific? I think you must have a few reflections and perhaps some advice.

A: Well, I don't know that I do, because I've been thinking about things that happened sequentially, or chronologically, during my career as we just ad-libbed along here. But I can say that my military career was one of great satisfaction. I hold no bitterness toward anybody. As a matter of fact, I'm not the type of person that was ever bothered by that. Just quite easily I accept resistance in some places; I overcome it when I can. When I can't, I accept whatever happens, so I have no bitterness. I had a great career in many ways, perhaps better than I should have expected. As a matter of fact, it was definitely more than I expected because, I told you, when we came out of West Point we thought we'd be captains in 17 years, and a few might retire as colonels at the age of 64. Obviously we all did better than that. I had a very satisfying career. I felt that I had, and it's shown itself in many ways; it does every day -- the respect I receive not only from my contemporaries but from my seniors for the most part, also from my subordinates. This has been very gratifying and very rewarding. They knew that I at least stood up for what I believed in, and I think this is important. I've seen a lot of commanders who were hailed as heroes over an easy victory. I've seen some fired when there was a failure to achieve that victory, and who might have performed better than the hero to whom success came easy because of the factors involved. I was interested, of course, after going to industry, to see the differences between the military and industrial side of it but, in many respects, it's the similarities that are more striking than the differences. After all, you are talking about people. The motivation of the military is one of its main assets, the devotion to country rather than the search for money. This is what upsets me about the volunteer Army. I don't think you can "buy it;" in other words, I'm sure you can't buy quality. You're not going to buy quality and with the kind of an Army being proposed, I don't know what you'd have when the chips were down; they might not be there when the whistle blew. Of course, you don't really have to blow reveille anymore, so you might find them over having beer with their lunch by that time.

I think the caliber of the senior officers in the Army is outstanding. I've compared them with people in industry, as I've compared them with people in other branches of the government, including the Executive and the Congressional, and, by and large, I have not found them wanting. I think that the group that are

selected for higher education and higher staff and command responsibilities in the Army are certainly not surpassed; they might be equal in other services, but they're not surpassed. I think we're as broad as if not broader gauged than any of the services in this respect, and I think time is showing that to be true, both in the military and in a considerable number of our people who go into successful positions in civilian life.

I think Washington is an odd place, because most people have some particular motivation other than just doing their job. This may be unfortunate, but I guess we're all victims of circumstances, just human beings. I've often referred to the four sweet P's of Washington, which are pay, power, prestige, and politics, and almost everybody plays to one of those. I don't know that the politician does any more so than the man in the military. Each one has a different approach to their goals in life, either their announced or unannounced goals, and this is also true of the scientist.

I've been concerned about the areas of interest of some of the scientific community who, because they have reached the highest level, supposedly, as education has indicated (Let's say a Ph.D.) nevertheless have set themselves up as arbitrary experts on almost any aspect of life today. In other words, they not only are physicists and chemists, but some of them attempt to solve the world's social problems. There's an intellectual arrogance on the part of some of this group that is very bothersome, and not only to me. It's showing itself throughout industry and through their attempt to have a greater impact on government.

Since 1957 we've seen the race for space go on, and I must say that one of the papers I'm breaking loose shortly is "Project Horizon." I might have mentioned it earlier, but in the earliest days when I was Chief of Research and Development it was apparent to me, as I've stated before, that there were military implications in space, and that the exploration, and perhaps even -- I won't say occupation, but let's say residence -- temporary residence on the moon would be important. Between the Ordnance and the Engineers, I directed them to come up with a plan for landing and living on the moon, and this carried it at least as far as the Russians have gone today with their lunar vehicle. In other words, we designed a comprehensive

program. When it was submitted to me and sent to higher levels, the project hit the fan. The greatest secrecy was clamped on it, which seemed to indicate military implications in space, and it looked as though we were taking something away from NASA that they didn't have yet. I now have had the two volumes of that project and my letters of instructions unclassified, and I think one of these days this is another story that should be told. At least we did get to and on the moon two years ago.